

TECHNICAL GUIDANCE DOCUMENT**INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT****Quality Assurance Project Plan – Guidance**

Office of Land Quality

(317) 232-3215 • (800) 451-6027

www.idem.IN.gov

100 N. Senate Ave., Indianapolis, IN 46204

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Introduction

A Quality Assurance Project Plan (QAPP) is an essential part of any environmental project. The QAPP guides the planning, implementation and assessment of the entire project and gathers in one place all activities of an environmental project involving the acquisition of environmental information. It should be a clear, concise, complete plan of the project activities. It can be as simple or as detailed as necessary to arrive at timely and correct decisions about the project. A QAPP documents not only the planning of the project but also states the decision making process, plans the data acquisition, establishes the quality criteria, and provides the means to assess the results of the investigations.

The amount of detail required for each of the QAPP elements will vary by site and project. Projects of a limited scope or small aspects of larger projects may require only minimal information in the QAPP. Projects of significant duration or effort are likely to require more information. In such cases, an expanded QAPP may be required to ensure that the field investigation and laboratory analyses are well planned and properly conducted to achieve the project goals.

Applicability and Scope

All environmental projects should have a QAPP. The efforts made in planning the management of the project, the overall objectives of the project, the data acquisition procedures, and the assessment of the results of the investigations can save time and money in the long run. A good plan can eliminate inadequate procedures, minimize decision errors, or avoid duplication of efforts or multiple mobilizations.

General Contents of a QA Project Plan

QAPPs are divided into four basic element groups: Project Management; Data Generation and Acquisition; Assessment and Oversight; and Data Validation and Usability. Each group consists of standard elements, 24 in all, that pertain to various aspects of the project. A QAPP that is

developed using the Data Quality Objective process and addresses the basic elements will define and describe the following:

- Data users;
- Project goals/objectives/questions or issues;
- Decision(s) supported by the information obtained;
- How, when, and where project information will be acquired or generated;
- Possible problems and actions to mitigate those problems;
- Type(s), quantity, and quality of data;
- How “good” those data have to be to support the decision to be made; and
- How the data will be analyzed, assessed, and reported.

Data Quality Objectives

The Data Quality Objectives (DQO) process establishes project quality objectives and criteria, and is inherent to QAPP development. IDEM prefers and recommends the use of the DQO process to develop those objectives.

The seven step DQO process is a formalized statement of a somewhat intuitive process that defines the problem, identifies the decision needed, identifies the inputs to the decision, defines the boundaries, develops a decision rule, specifies limits for decision errors, and optimizes the design for obtaining data (see Table 1). It is intuitive because some of the seven steps are made by an experienced investigator without actually making a conscious decision about a step.

The DQO process is also iterative; it is reviewed and updated as additional information becomes available. Additional information may and often does change the objectives of a project. The QAPP and DQOs should be reviewed and updated after pre-screening activities, site visits, screening analytical results, nature and extent investigations, and for closure activities.

Table 1 gives examples of the DQO process for screening the soils at a site.

Table 1

Step	Description	Examples for Screening
1. State the Problem	Summarize the contamination problem that will require new environmental data and identify the resources available to solve the problem	Identify areas where contamination may pose a risk to human health.
2. Identify the Decision	Identify the decision that requires new environmental data to address the contamination problem	The decision is to determine if soil and ground water concentrations exceed screening levels for specific COCs within the potential source areas(s). If concentrations exceed screening levels, further investigation is required.
3. Identify Inputs to the Decision	Identify the information needed to support the decision and specify which inputs require new information	<ul style="list-style-type: none"> • Exposure inputs such as ingestion, dermal contact, and leaching to ground water potential. • Identify potential COCs • Analytical methods and detection levels • Applicable screening levels • Quality assurance concerns
4. Define the Boundaries	Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision	<ul style="list-style-type: none"> • Define potential source area(s) • COC concentrations • Define potential exposure pathways • Determine if background evaluation is necessary
5. Develop a Decision Rule	Develop a logical “If . . . then . . .” statement that defines conditions that would cause the decision maker to choose among alternative actions.	If the soil constituent exposure point concentration within the potential source area exceeds screening levels, further investigation is necessary. If COCs are detected in ground water, further investigation is necessary.
6. Specify the Limits on Decision Errors	Specify the decision maker’s acceptable limits on decision errors which are used to establish performance goals for limiting uncertainty in the data.	Determine that enough samples were collected, the coefficient of variation was acceptable, and the accuracy of the data did not affect decision of meeting screening levels.
7. Optimize the Design for Obtaining Data	Identify the most resource effective sampling and analysis for generating data that are expected to meet the DQOs.	Update the QAPP, including statistical sampling design, sampling and analytical methods and provide sufficient detail on each QAPP element.

QAPP Elements

The EPA *Guidance for Quality Assurance Project Plans*, EPA QA/G5, EPA/240/R-02/009, dated December 2002 details each element of a QAPP. This document gives excellent examples of what is expected in each element and should be consulted when developing the QAPP.

There are four main parts of the QAPP: Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability.

Project Management

The Project Management section lists the roles of individuals involved with the project, defines the problem, and states the task descriptions. It uses the data quality objective system, i.e., the DQO process. It specifies the quality criteria for the precision, accuracy, representativeness, completeness, and comparability. All subsequent elements should be consistent with the objectives and criteria stated in this section.

Major elements of the Project Management section include:

- Project/Task Organization

This element identifies the roles and responsibilities of individuals and organizations involved in the project. It identifies the principal data user(s), decision maker(s), and information producer(s).

- Problem Definition/Background

This element states the specific problem, the decision to be made or the outcome to be achieved. It may also include any historical background information pertinent to the project.

- Project/Task Description

This element summarizes the work to be detailed in the remaining elements. It can summarize information previously collected or to be collected. It can describe a Conceptual Site Model. It can indicate contaminants of concern from previous investigations or expected at the site. It can include maps, diagrams, or tables as appropriate. It should also include an expected work schedule.

- Quality Objectives and Criteria

This element establishes the measurement performance or acceptance criteria needed for project data. These are often expressed as the Data Quality Indicators, i.e. the precision, bias, accuracy, representativeness, completeness, and comparability statements.

Data Generation and Acquisition

The Data Generation and Acquisition section includes part of a traditional sample and analysis plan. It guides the implementation part of the project. It includes all procedures necessary to collect and document activities that generate environmental data in both the field and laboratory. This includes the sample design, sampling

methods, analytical methods including performance criteria, quality control procedures for both field and laboratory, and procedures for testing, maintaining, and calibrating equipment. It also describes the data management system – that is, how data will be recorded, validated, transmitted, and analyzed.

Major elements of the Data Generation and Acquisition section include:

- Sampling Process Design

This is a description of the project's experimental design. This element explains the “how and why” of the information collection design. It defines the size, area, shape, volume, or time to be represented by a sample. It will detail whether the design is probability based (statistical designs) or judgmental (directed sampling or grab samples). It should detail the number of samples, locations, and quality control samples (e.g. field duplicates, blanks, etc.) It should identify potential sources of variability that would affect the sampling period(s) such as seasonal differences or rain and wind patterns.

- Sampling Methods

This element describes how samples will be collected consistently between locations and/or sampling teams. It describes what constitutes a sample, e.g. grab or composite, split, or sub-sample. It should describe how much sample volume is needed and what type of sample containers will be used. It will indicate whether equipment will be decontaminated and procedures to ensure there is no carryover between sample locations. It will describe any corrective actions that might be necessary if or when procedures do not go as planned.

- Sample Handling and Custody

This is a description of sample handling requirements and transfer procedures. It describes conditions necessary to keep samples in their original condition during collection, transportation, and storage. These include sample container(s), preservatives, icing transport containers, and appropriate packing material. It will indicate the maximum holding times for each type of sample and matrix. It should describe the project's sample tracking system, including notebooks, sample identification procedures, and means of identifying sample locations, dates and times. It should describe any sample labels, custody seals and forms necessary for the project. It should explain the chain of custody procedures that trace the possession and handling of sample(s) from collection, through transportation, through laboratory analysis.

- Analytical Methods

This element identifies field and/or laboratory analysis, including preparation or extraction methods. If standard EPA methods are used, cite the method number and version. Indicate method performance specifications such as reporting limits of any method and note if they meet the project objectives. If non standard methods are used, include procedures that would ensure project objectives are met. Identify any corrective actions that might be necessary during analysis.

- **Quality Control**

Quality control provides an estimate of variability in the measurement process whether in the field or laboratory – a measure of reliability and confidence in the results. This element should list quality control activities needed for sampling, analytical, or measurement techniques. It should also list the frequency and type of these activities (e.g., various blanks, spikes, calibration checks, and duplicates). It should include the quality control limits for each activity, with specific criteria. Examples include calibration checks within plus/minus X%, matrix spike recoveries between Y and Z%, or field duplicate relative percent difference less than ABC %. The element should indicate how results will be interpreted if outside of the given ranges, and describe any corrective actions that might be necessary.

Project Assessment and Oversight

The Assessment and Oversight section details plans for measuring the progress of the project. This and the next section are the assessment phase of the project. It should establish procedures for documenting whether plans have been followed, what changes were required and whether the changes were documented in preceding sections, and whether data can be used for the intended purposes. It should also provide for periodic reporting requirements. This section assesses the project as opposed to assessing the data.

Data Validation and Usability

The Data Validation and Usability section describes the process by which to assess whether the data obtained will fulfill the project objectives and identify any effect of deviations. This process can be used to assess pre-existing data as well as recently acquired results. Data verification evaluates performance against pre-determined criteria, e.g., whether all samples were collected, documented and delivered as planned. Data validation is an analyte- and method-specific process to evaluate the results against pre-determined quality criteria. Finally, it describes how to evaluate the results against the user requirements established in the DQO process, and determines if the original questions have been answered.

Major elements of this section are:

- **Data Review, Verification, and Validation**

This element lists the criteria for deciding to accept, reject, or qualify project information. It is a final check that information planned in previous elements was collected in the planned manner. Verification evaluates the field and laboratory performance against pre-determined specifications. Validation is an analyte- and method- specific process to evaluate the quality of the data relative to its end use using the criteria determined in previous elements.

- **Reconciliation with User Requirements**

This describes how the validated data will be evaluated to determine if the original objectives were met. It is the final assessment of the data quality and the culmination of the QA process.

Project Evaluation

Project managers should be able to make a decision on the status of the project after the assessment process described above. If all data meet the project objectives, the decision could be to move to the next step in the RCG process, e.g. from screening to determining nature and extent, or from remediation to closure.

If it is determined at this point that the original objectives have not been met or the objectives have changed, the QAPP process can be repeated. The DQOs are reevaluated, a sample design might be expanded, new data may be collected and assessed. The Conceptual Site Model can be revised or updated.

At the end of the above procedures, depending on the specific step of the RCG process the project is in, the following questions should have been answered:

- Does contamination exist at the site?
- Does the constituent(s) concentration in a particular source area exceed screening levels?
- What are the soil and water characteristics in the potential source area(s)?
- What are the horizontal and vertical extents of contamination?
- What volume and type of media contain COC concentrations exceeding screening levels?
- Does the contamination pose risks to human health and the environment?
- Did remediation reduce or eliminate COC concentrations in the affected media to less than the screening levels?

Health and Safety Plan

Another element of any project is a Health and Safety Plan (HASP). The HASP details field activities conducted in compliance with OSHA requirements. The HASP should be completed by a competent professional with appropriate training and experience, and should comply with the requirements of 29 CFR 1910.120.

References

There are several EPA web sites on quality management systems. Guidance for the DQO process may be found at <http://www.epa.gov/quality/qs-docs/g4-final.pdf>. An especially useful site for developing a QAPP is at <http://www.epa.gov/quality/qs-docs/g5-final.pdf>.

Chapter Two of G-5 gives detailed element-by-element guidance on what is expected in each element, with specific examples.

Guidance for data verification and validation is at <http://www.epa.gov/quality/qs-docs/g8-final.pdf>. Guidance for data assessment with an emphasis on statistical methods is at <http://www.epa.gov/quality/qs-docs/g9r-final.pdf> and <http://www.epa.gov/quality/qs-docs/g9s-final.pdf>.

General soil sampling rationales may be found at “Soil Screening Guidance: User’s Guide” EPA/540/R-96/018 April 1996 and the “Soil Screening Guidance: Technical Background Document”, EPA/540/R-95/128, May 1996.